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WHEN THE GRAND TOUR'S A GRIND
(Reprint)

By
Stanley C. Knapp

September 1981

U.S. ARMY AEROMEDICAL RESEARCH LABORATORY
FORT RUCKER, ALABAMA 36362

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20. ABSTRACT

Americans are traveling more and, in the view of many observers, enjoying it less. Modern jet travel, along with the necessity or desire to see as many tourist sights or conduct as many business meetings as possible in a single day, serve to create a well-defined but often overlooked symptom complex called travel stress. Travel stress is the complex interaction of a number of environmental, physiological, and psychological stressors. Disruptions in the traveler's circadian rhythm, changes in dietary habits, noise, vibration, pattern changes in the use of stimulants and alcohol, and the pressure of trying to get the most for one's travel dollar impact the health and efficiency of the traveler. This paper outlines proven and practical pre-travel prevention techniques and en route therapy.

Americans are traveling more and, I believe, enjoying it less. The desire or the need for economy--in terms of both finance and time--impel the average international traveler to fly. Ships are for the idle and the wealthy; island- or city-hopping for the retired or the carefeee; flying by propeller aircraft is passé if not entirely past. Instead, it's Monday breakfast in New York, lunch in San Francisco, Tuesday morning business in Tokyo, Wednesday conference in Hong Kong, briefings in Chicago on Thursday, and home for cocktails at seven o'clock Friday evening. For the tourist, it's Europe in ten days, the South Seas in 17, the world in 21. The faster, the farther, the better.

Or is it better? I maintain a good time is *not* had by all. The businessman makes basic errors in decisions; the tourist can't remember what he saw last; both are irritable, anorexic, insomniac, depressed. Why? Well, these are the effects of what I call travel stress.

We all recognize that certain human factors and parameters of physiologic and psychologic adjustment and adaptation are relatively fixed or slow to change: requirements for sleep, food, fluids, exercise, shelter, warmth, sensory stimulation, recreation, periods of quiet, and physical, social, and psychologic support. Man is able to adapt to most situations--but not immediately. His physiologic or circadian rhythms are essentially unalterable over long periods of stress, let alone sudden environmental changes such as going from sea level to mountainous terrain, from arctic to equatorial climates, from tropical to arid areas, or from land to water. Until he accommodates to such changes or deprivations, his responses understandably cover a wide range of physiologic and psychologic spectrums; Drs. Hollberg, Kline, Schering, and others have established individual responses ranging from obscure biochemical aberrations to physical and mental degradation. I'm not attempting here to examine this fundamental research or even to discuss the various biochemical aberrations but to suggest to practicing physicians how both they and their patients setting out to see the world in 21 days can be helped to enjoy it more--to touch on things that create a better environment for a traveler who really isn't enjoying his trip even if he thinks he is.

First, let's talk about the average middle-class American family trying to get the most for their travel dollar. When do they pack? At eleven o'clock the night before they're scheduled to get on a 7 a.m. plane. In fact during the day before departure the children have to be delivered to the baby sitter, meals are missed, last-minute work has to be finished, the dog must be put in the kennel, the cat delivered next door, the plants watered. Then the travel agent calls at four o'clock in the afternoon and says there has been a change in the itinerary. This means phone calls to Grandma, the office, the baby sitter, the vet. It means eating on the run; all at the last moment.

Furthermore, most Americans have a poor itinerary. Airlines don't schedule flights for the benefit of their passengers; they schedule for their own convenience, depending on when they can get the routings, when they can get the most competitive schedule, when it's most economical for the airline. And because he wants to get the most out of his vacation and most travel plans begin when one actually leaves the continental United States, the traveler likes to leave some time after midnight so he can arrive at his destination and have a full 21 days to see the world. It's an overflowing itinerary with minimum layovers but long waits. If you've ever waited in Chicago's O'Hare Airport for three hours, you know what I mean about a minimum layover but a long wait. During this period the traveler gets no rest, his eating habits are disrupted, he snacks on high-carbohydrate foods, and he suffers the indefinable fatigue of constant waiting.

Now let's look at some of the other stresses that can occur along the way. First, the one that's most talked about, the disruption of the biologic clock, the circadian rhythm--call it jet lag, jet-traveler's fatigue, any of a multitude of synonyms. The normal rhythmic monocyclic events that occur in the body--from body temperature, blood pressure, pulse rate, enzyme actions, cell metabolism, brain metabolism, to the digestive system--are disrupted in some way during the trip by the requirement that the body and mind function out of phase. In other words, when your body thinks it's time for breakfast, it may be, in fact, one o'clock in the morning or your body may be ready to go to bed when everyone else is on his way to work.

Let's examine this. Let us assume that you're going to fly east from Chicago to middle Europe and you leave Chicago at 9 a.m. with a stopover at Kennedy. With a minimum delay there, you pick up your next flight and arrive in middle Europe about 12 hours later. Now--depending on the time of the year or the state of the energy crisis or whether it's daylight-saving time in New York--you're going to have a shift of from five to six hours between Chicago and, say, Frankfurt or Vienna. As far as your body clock is concerned, you arrive at 9 p.m. If you had stayed in Chicago, it would be getting close to the time to go to bed. But local time is 3 a.m. The sun is beginning to come up and you don't want to waste that first day--because, remember, you're on a ten-day itinerary for Europe; if you go to bed and sleep through the day then you have only nine days left and you won't see Vienna or Salzburg.

Or let's take it going the other way. You leave O'Hare at 8 p.m. on the 27th and you want to leave the United States as soon after midnight as possible, so you fly to Los Angeles where you have a minimum delay, and then, flying the polar route, you arrive in Tokyo at approximately 2 p.m. Chicago time on the 28th. But it isn't the 28th in Tokyo, it's actually 4 a.m. on the 29th. You have traveled one day in time but have spent two days in the process--you've lost an entire day, if you will.

Schering did some work on normal adult men in an isolated situation, where he altered only the diurnal cycles; he found that epinephrine and

17-hydroxycorticosteroid peak just before an individual gets up in the morning, mobilizing the body to rise and get to work. Blood pressure, too, begins to rise. Yet the traveler to Europe must begin his day's activities just as his body is beginning to slow down and go into reverse, to prepare for rest.

But let's look at a couple of other stress factors that are very rarely discussed. When you travel in a commercial airliner, the plane must maintain a pressure differential, between the inside and the outside of the hull, of between 8 and 9.5 pounds per square inch. This means that when it flies at an altitude of 40,000 feet, the cabin altitude is about 7000 feet. Or, with a flight altitude of about 31,000 feet, the cabin pressure is about 6000 feet. If you've gone in one day from sea level, say from New York City, to Denver or Colorado Springs, you probably remember how you felt 12 hours after your arrival. Some people don't experience this as stress. But an older person will. What happens at 5000 feet? Well, alveolar oxygen pressure drops to about 79, whereas at sea level it's about 100; you have an early sign of tachycardia because of the stimulation of the aortic bodies. Your respiratory rate increases slightly. And you have an acid-base balance shift; granted, this will be slight but enough so that during your first day in Denver you are apt to feel blah. The traveler who flies has the same problem; more pronounced for some, less for others. The problem will be more acute for smokers, because smoking while flying in effect raises the smoker's physiologic altitude 3000 feet above the normal cabin altitude.

Low humidity is another stress. It's impossible to compress outside ambient air at 2 to 3 pounds per square inch to the pressures required for safe flight in the cabin without bleeding a great deal of power off the engines. In the process, a lot of water vapor is lost due to the high heats involved. Humidity inside the commercial airliner averages 10 to 12%. This gives rise to the problems of minor nose bleeds, conjunctival irritation, a dry feeling in the throat. People with any of the conditions that cause a lack of tearing can suffer severe problems. Also, if you fly more than 12 hours at this altitude, especially if you're ingesting alcohol and large amounts of coffee, with its diuretic effects, your blood starts to become concentrated as you begin to dehydrate.

Irritants are another problem. Ozone and nitrous dioxide, both pulmonary irritants, aren't much of a problem at a high altitude but if you take off from Los Angeles, lots of smog is pulled in through the engines while cabin pressure is being built up. The odor of ozone and oxide is unmistakably apparent.

The next problem is noise. Ambient noise levels in commercial airlines range from 75 to 100 decibels. And since 100 decibels is above the damage-risk threshold, you can get a temporary shift in your hearing. How much depends also on where you sit in the aircraft. If you are flying in a DC9 from Chicago to Los Angeles and you are sitting behind one of the turbine blades in the back, before you even begin your trip the decibel levels would be up

in the vicinity of 110 to 120. The stress here is on your ability to sleep. Some people can sleep in that kind of environment but most can't.

Inactivity is another stress. Sitting six abreast in a 707 provides little option for exercise and moving the venous pools that begin to collect in the lower extremities. When you add this to the dehydration, the smoking, the alcohol, and the vasomotor instability, it's no wonder that people complain of feeling cramped and of aching legs. The next time you fly, look at the man in front of you and see how long it takes him to start to squirm.

Two other stresses are fear and apprehension. Many of the people who set off to see the world in 21 days have never flown before or at least have never flown across an ocean. Fear and apprehension give rise to all sorts of indefinable fatigue responses. I call it the sweaty-palm and white-knuckle syndrome. Look around the next time you fly anywhere, and you'll almost certainly find someone with it.

Excessive eating builds up another stress. Not only do we eat at the wrong times, we don't eat the things we'd normally eat at home--and we eat too much. Two meals are served on the plane. Then, since there's nothing else to do in the air terminal, we eat there. And, of course, when we get to Japan or to Germany we must sample the sausage, the sauerbraten, the sukiyaki. Remember, we have to see the most and go the farthest in the least amount of time and that means eating as well--with no time for recovery between meals.

Is there a way to enjoy travel more? Yes, there is. Diplomats know that time is a tactic and a strategy; they allow a period of time to recover. Disruption of the circadian cycle alone requires a recovery time of approximately one day per hour of disruption. If you're six hours out of phase by going east to middle Europe, you'll need six days to get your internal clock back to local time in Germany. But, of course, by then you'll be in Italy or Scandinavia or on the way to Israel. If you go west to Japan, you're 12 hours out of phase, 180 degrees out of cycle, and it will take anywhere from ten to 14 days to recover. When President Nixon went west to China, he made three stops en route. This was very carefully planned to allow him the maximum acceptable time to rest and sleep at these intermediate stops before making any decisions. If you look at the timing of Brezhnev's trip here, you will notice that his decisionmaking periods, the time in which he was actually engaged, were carefully timed during the day to correspond to the height of *his* circadian cycle. Whether the time was entirely appropriate was not important. I know a physician who feels that Henry Kissinger is one of those individuals who doesn't have many signs and symptoms of circadian dyssynchrony. Some people don't; they can travel all the time. And I suspect Dr. Kissinger does fall into this category; however, a man in his position can avoid some of the other stresses. He doesn't have to carry his own bags or hunt up taxis; he can avoid all the little stresses, not very important in themselves but all adding to that indefinable fatigue.

So here's what I tell my patients. Take care of the last-minute chores long in advance. Get adequate periods of rest and don't eat heavily before you leave. Everything conspires to prevent you from sleeping en route--altitude, noise, even overeating, which keeps the GI tract more motile than it normally is during the sleep cycle. So try to time your arrival as near the local bedtime as possible. You may not feel like going to bed. But if it's dark outside and you can't do anything anyway, you'll get at least three or four hours' sleep. You'll be surprised at how you feel when you wake up the next morning. If you try to sleep during the flight and you arrive early enough to have a full day ahead of you, chances are you won't enjoy that day; you may not even remember it.

Plan your itinerary so that you can provide some quiet time in each city. If you're going east, it may help to delay bedtime one hour a night for three or four nights before leaving; if your normal bedtime is ten o'clock, make it 11 one night, 12 the next, and one the next. This begins to phase you. If you're going west, go to bed earlier. During the flight, go easy on smoking. Drink extra fluids, but not alcohol and not coffee. Caffeine tends to change the amplitude of the corticosteroid outputs during the circadian cycle. However, coffee may be used as a stimulant when you arrive at your destination. As for mucosal irritations, I suggest to my patients that they use gum, lozenges, and hard candy because these soothe and bathe the mucosal membranes. I always give them some lip ice or petrolatum and for their eyes, a little bottle of methylcelulose; Murine and Visine don't have the same lubricating effect.

Sit in the no-smoking zone. In most aircraft traveling internationally this zone is forward in the coach compartment, which also happens to be the quietest and most vibration-free part of the aircraft. So for the first-flight passenger, sitting there may cut down on the sweaty-palm and white-knuckle syndrome as well. Use earplugs; they may help you to fall asleep--not REM sleep perhaps, but you will be able to rest. Finally, move around. Get that pooled blood moving.

As far as drugs are concerned, I recommend none. Barbiturates are known to reduce REM sleep and they only compromise the ability to recuperate from sleep. Amphetamines just drive the body and drive the achrophase portion of the circadian cycle. Dimenhydrinate or meclizine hydrochloride may help to sedate the traveler as well as reduce any tendency to air sickness.

Try some of these techniques; a number of your patients may well find their next *voyage* more *bon*.

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